GRASP and TARGETS for Airspace Analysis

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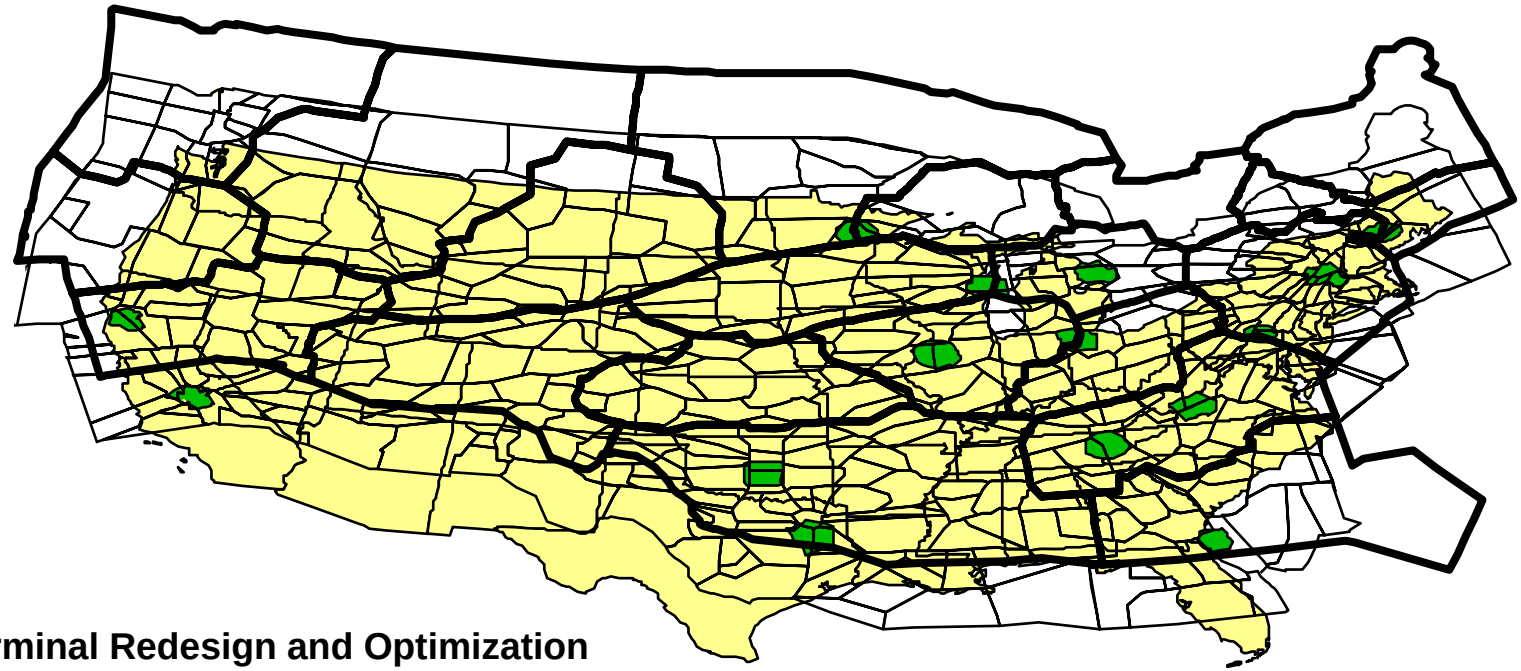
National Airspace Redesign



Terminal Redesign and Optimization
- New Runways
- Consolidation of airspace
- New technologies

En Route Redesign and Optimization
- Accommodate terminal changes
- Volume and workload balancing

Cross Facility Coordination
- National redesign

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Tools Used by CAASD for Airspace Redesign

CRCT	Collaborative Routing Coordination Tool	CAASD
DPAT	Detailed Policy Assessment Tool	CAASD
EACM	Enhanced Airfield Capacity Model	CAASD
GRAIL	GRAIL Real-Time ATM Integration Lab	CAASD
GRASP	GRail AirSPace Toolkit	CAASD
IDAT	Intersect Density Analysis Toolset	CAASD
MapInfo		COTS
NIRS	Noise Integrated Routing System	FAA / Metron
SDAT	Sector Design and Analysis Tool	FAA
TAAM	Total Airspace and Airport Modeller	Preston
TARGETS	Terminal Area Route Generation, Evaluation and Traffic Simulation	CAASD

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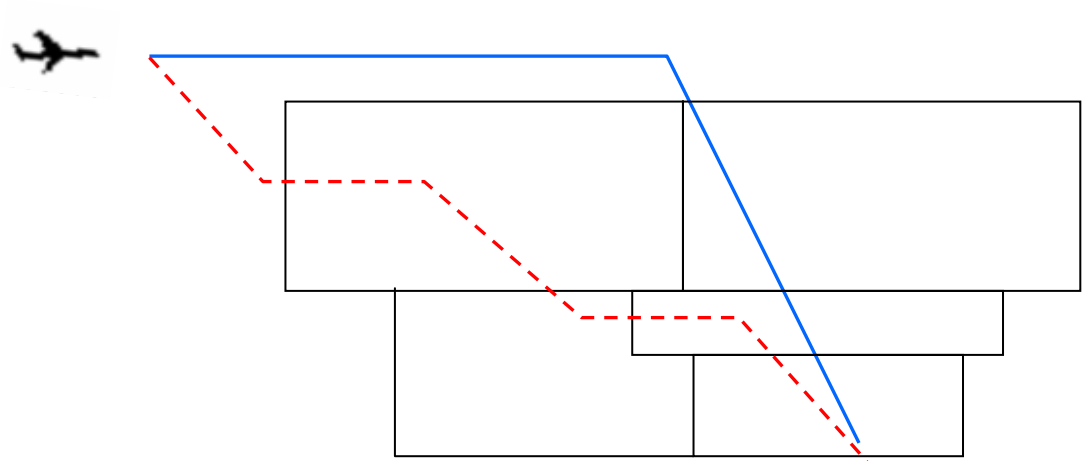
Airspace Analysis

- **Current toolset has gaps for both en route and terminal modeling**
  - **En route modeling needs are more challenging**
- **Combinations of tools sometimes are necessary to support analysis of proposed airspace changes**
  - **Additionally models can be built from scratch**
- **Better design tools to be used by design team members helps to create a more streamlined and efficient process**

Existing Gaps in En Route Modeling

- **Altitude restrictions**
  - **Erroneous sector counts**
    - **Modeling trade-offs for existing tools are needed to provide workarounds for existing short comings**
    - **GRASP used to support analysis not requiring delay**



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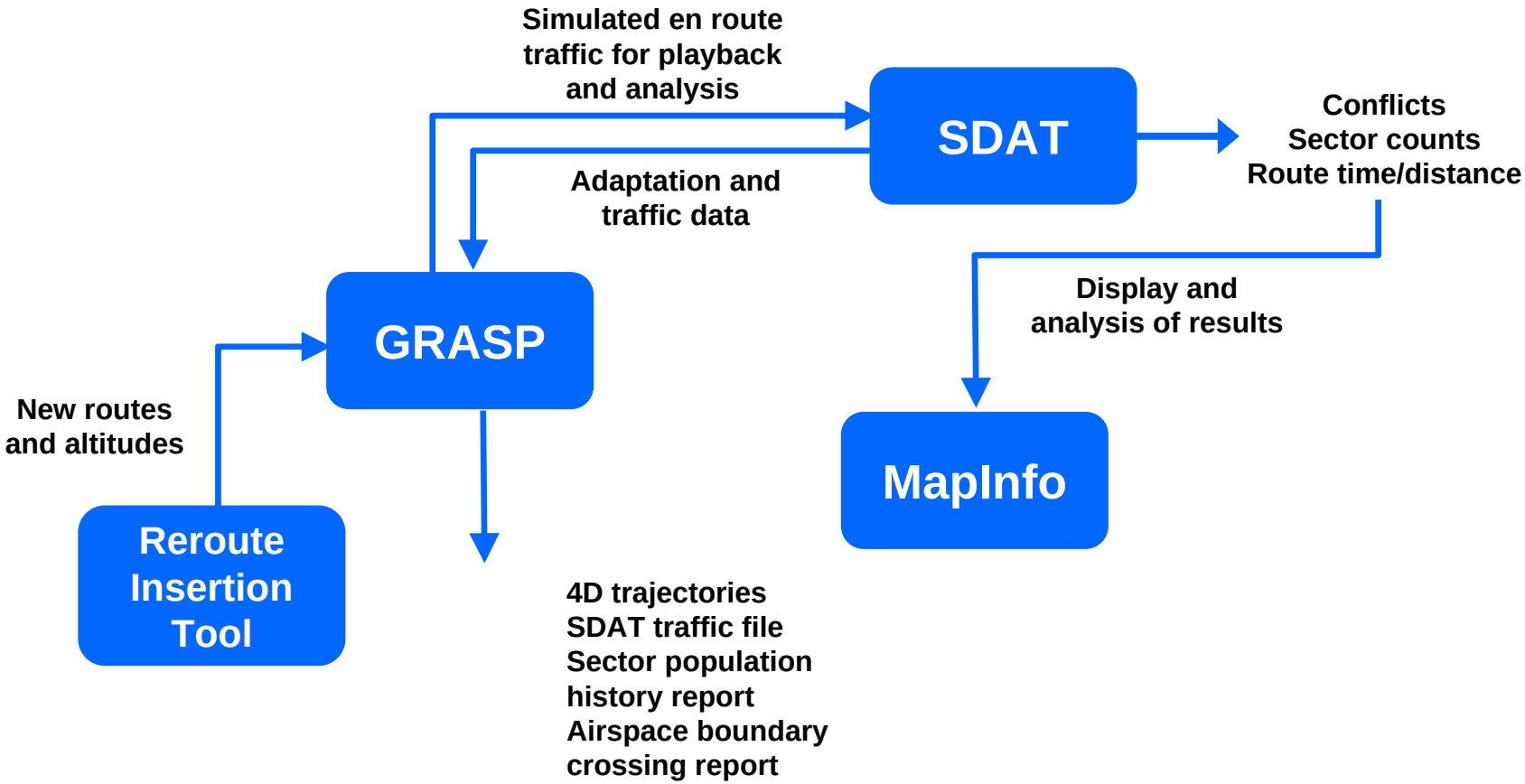
Existing Gaps in En Route Modeling *(continued)*

- **Appropriate location for delay**
  - **Current capabilities suitable for estimating aggregate delays**
  - **Appropriate location of delay for NAS/Regional/En Route studies more difficult to model**
- **Traffic Flow Management initiatives**
  - **There is no accepted workload model in United States**
  - **To overcome current limitations in modeling the need for Traffic Flow Management initiatives, parametric analysis using controller input can be used**

GRAIL Airspace Toolkit (GRASP)

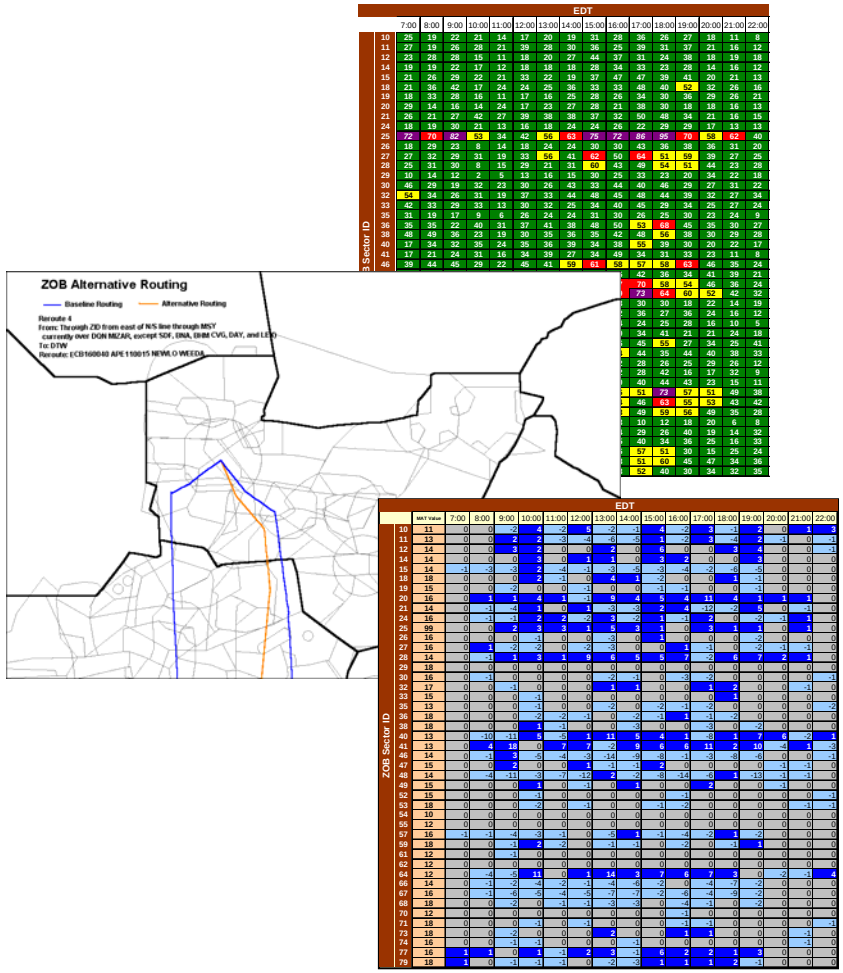
- **GRASP**
  - **Provides tools which allow analysts to quickly examine the impact of changes to airspace and aircraft routes**
  - **Capability 1: conversion of flight plan to trajectory**
    - **Includes restrictions, aircraft type**
  - **Capability 2: report generation**
    - **Uses trajectories and flight plans**
    - **SDAT traffic file**
    - **Sector population history report**
    - **Airspace boundary crossing report**
    - **Additional utility reports**
- **GRASP used to support large scale airspace projects involving changes to routes and altitude restrictions**

En Route Analysis



GRASP Output

- **GRASP output used to:**
  - **Baseline and alternative sector counts**
  - **Alternative route depiction**
  - **Fix loading**
  - **Sector count differences**
  - **Flight time and distance differences**
  - **Traffic animation**



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Shortcomings for En Route

- **No tool able to collectively address each shortcoming**
  - **If multiple tools used, changes in airspace design may need to be updated in each model**
- **However, workarounds for current en route modeling gaps still exist for**
  - **Altitude restrictions**
  - **Appropriate location for delay**
  - **Traffic Flow Management initiatives**

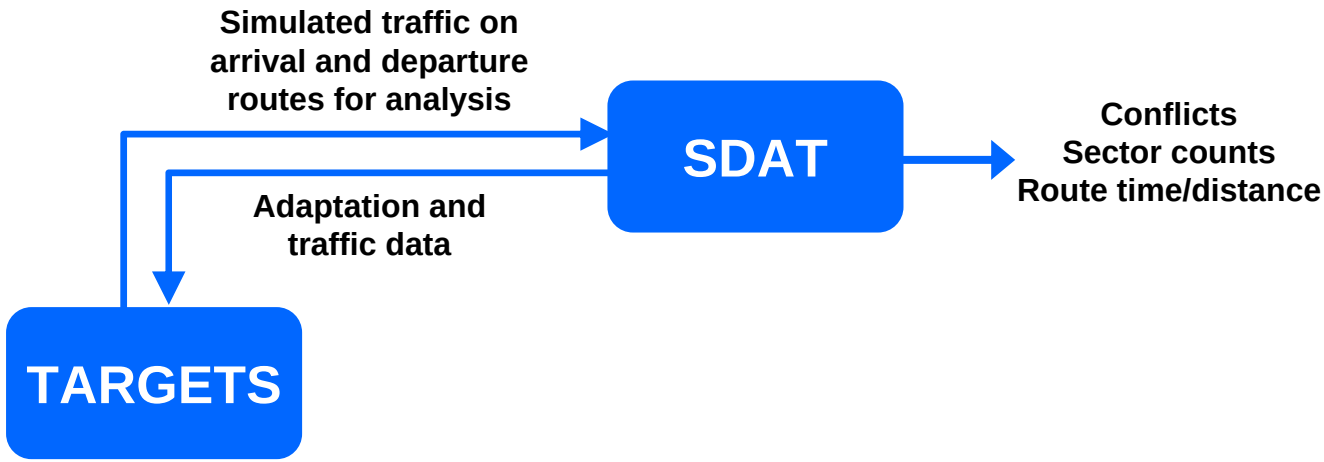
Terminal Modeling Issues

- **Existing toolset has limitations for terminal modeling needs**
  - **Holding**
  - **Paired operations**
  - **Ground movement**
- **Many limitations can be overcome**
  - **Workarounds**
  - **Post processing of data**
  - **Building models from scratch**
- **These efforts can be costly**

Terminal Area Route Generation Evaluation and Traffic Simulation (TARGETS)

- **GIS capability tailored to procedure and airspace design and analysis**
- **Full Procedure Builder**
  - **En Route, Common, and Runway Transitions**
  - **SIDs, STARS**
- **Used to design arrival and departure routes**
  - **May be adequate to determine feasibility of new design if delay is not important**
  - **Designs can be used to input into other tools**
    - **TAAM**
    - **SDAT**

Terminal Area Analysis:
No Delay Analysis Needed



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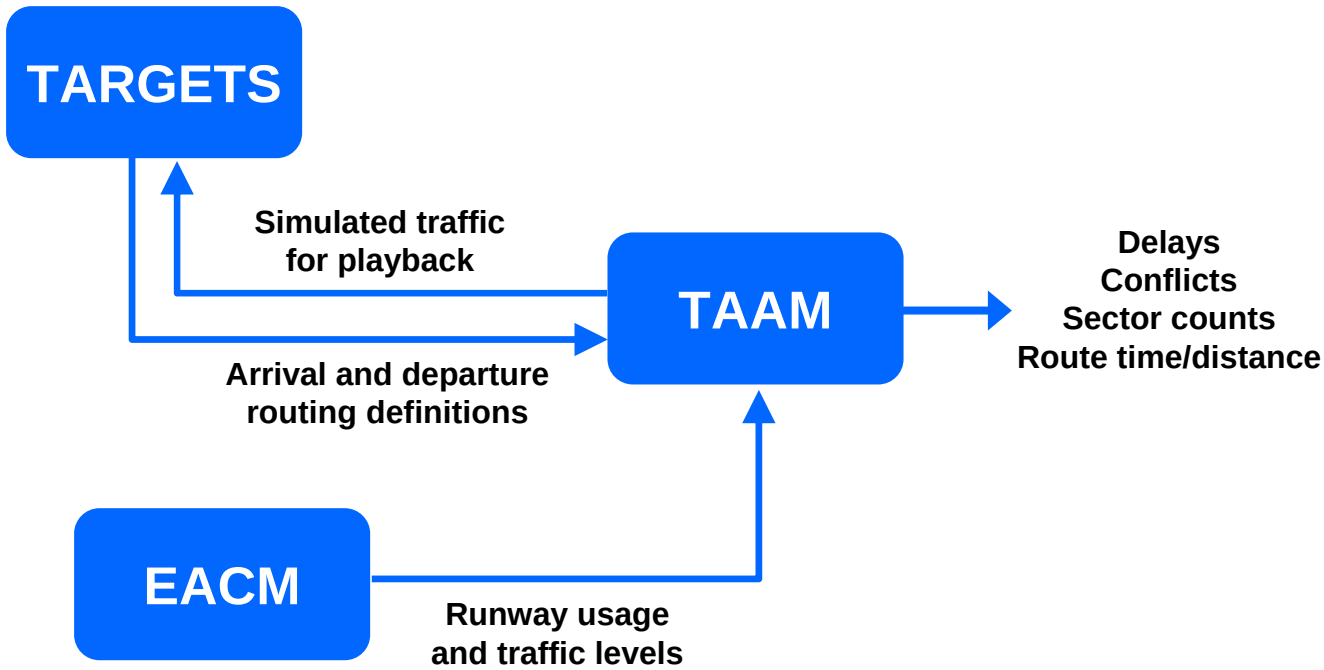
Terminal Area Analysis:
Delay Analysis



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